Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Experimental Observation of Bulk Liquid Water Structure in "No Man's Land"[1] JONAS SELLBERG, TREVOR MCQUEEN, CONGCONG HUANG, SSRL, SLAC, DUANE LOH, HARTAWAN LAKSMONO, RAYMOND SIERRA, CHRISTINA HAMPTON, DMITRI STARODUB, PULSE, SLAC, DANIEL DEPONTE, ANDREW MARTIN, ANTON BARTY, CFEL, DESY, THOR WIKFELDT, DANIEL SCHLESINGER, LARS PETTERSSON, Physics Department, Stockholm University, MARTIN BEYE, DENNIS NORDLUND, THOMAS WEISS, SSRL, SLAC, JAN FELDKAMP, CHIARA CARONNA, MARVIN SEIBERT, MARC MESSERSCHMIDT, GARTH WILLIAMS, SEBASTIEN BOUTET, LCLS, SLAC, MICHAEL BOGAN, PULSE, SLAC, ANDERS NILSSON, SSRL, SLAC — Experiments on pure bulk water below about 235 K have so far been difficult: water crystallization occurs very rapidly below the homogeneous nucleation temperature of 232 K and above 160 K, leading to a "no man's land" devoid of experimental results regarding the structure. Here, we demonstrate a new, general experimental approach to study the structure of liquid states at supercooled conditions below their limit of homogeneous nucleation. We use femtosecond x-ray pulses generated by the LCLS x-ray laser to probe evaporatively cooled droplets of supercooled bulk water and find experimental evidence for the existence of metastable bulk liquid water down to temperatures of 223 K in the previously largely unexplored "no man's land".

[1]We acknoweledge NSF (CHE-0809324), Office of Basic Energy Sciences, and the Swedish Research Council for financial support.

Jonas Sellberg
SSRL, SLAC National Accelerator Laboratory

Date submitted: 07 Nov 2012 Electronic form version 1.4